

- Radar Observations of Asteroid 1998KY26

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The discovery of this object by T. Gehrels and J. Larsen (Spacewatch) was announced on 1998 June 1 (MPEC 1998-L02), and we used the Goldstone X-band (8510-MHz, 3.5-cm) radar to observe it on June 6-8. The echo bandwidth was clearly greater than 11 Hz, providing the constraint  $P < 0.55D$ , where  $P$  is rotation period in min and  $D$  is the diameter in m. Delay-Doppler images with a range resolution of 19 m did not resolve the asteroid, suggesting a diameter no greater than 40 m and therefore  $P < 22$  min, considerably shorter than any other period reported for a solar system object. Such a rapid spin requires that the asteroid be held together by its tensile strength and not just by gravity. Subsequently, optical photometry revealed that  $P = 10.7$  min (Pravec and Sarounova 1998, IAUC 6941; Hicks and Rabinowitz 1998, IAUC 6945), so our bandwidth lower limit yields  $D > 19$  m.

The asteroid's circular polarization ratio SC/OC, of echo power in the same circular polarization as transmitted to that in the opposite circular, is about 0.5; this value reveals considerable wavelength-scale roughness and is consistent with a surface that lacks regolith and is pockmarked by abundant tiny craters. If we assume that the asteroid's projected area equals that of a sphere of diameter  $D > 19$  m, then the asteroid's total-power (SC+OC) radar albedo is less than 0.20, a result that probably rules out a purely metallic, solid surface.

1998KY26 is smaller than all other radar-detected asteroids, and its distance during our observations ( $0.8E6$  km = 2.1 Earth-Moon distances) was less than that during all previous asteroid or comet radar experiments. Our observations used a two-antenna (bistatic) configuration, with DSS-14 transmitting and DSS-13 receiving. The last time a bistatic radar produced the initial detection of an asteroid was during Goldstone observations of 1566 Icarus in June 1968, during the first asteroid radar experiment.

Our delay-Doppler astrometry triples the length of the interval over which 1998KY26's position can be estimated with confidence, from 1959-2024 (optical data only) to 1911-2099 (radar and optical data). The discovery apparition offered the best 1998KY26 radar opportunity until the 22nd century.